

# IOM FDV-3W-DH1

Electro-Pneumatic Actuation with Remote Reset Deluge Valve

Installation **O**peration & **M**aintenance manual

**Fire Protection**

## RAPHAEL VALVES INDUSTRIES

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## Description

This deluge system is based on Raphael's FDV valve, equipped with hydraulic actuated control trim. This valve and its trim have a range of optional materials and coating to fulfill various operation and ambient conditions, but the system function principle stays unchanged: in fire situation, a hydraulic detection system, (a wet pilot line with automatic sprinklers), trips the 3-way hydraulic actuator. Consequently, this actuator drains the pressurized water trapped in the FDV's control chamber and the valve opens.

The valve is fully accessorized and can be supplied under a flexible scope in terms of special accessories properties (for seawater, brackish water, explosion proof etc.)

The system is suitable for water spray pipelines with open nozzles.



## Operation (reference figure 1)

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### Set position:

Water is supplied by the trim supply valve (7), through the “Y” strainer (4), check valve (3) through the HAV-3 actuator (12), and fills the FDV’s control chamber. Pressurized water in the valve’s control chamber gets trapped by the check-valve (3), and by the closed MEU Emergency valve unit (8), maintaining the deluge valve in closed position. The pressurized water in the Wet pilot line (connected to HAV-3’s control chamber through port (12), holds it in its state where its inlet is connected to the control chamber port.

### Fire situation:

When one or more of the automatic sprinklers located along the Wet pilot line gets subjected to flames heat and blows-open, it depressurizes the pilot line. This pressure drop causes HAV-3 to shift to its OPEN state and drains the FDV deluge valve’s control chamber. The opened FDV valve admits water into the sprinklers pipeline/s.

Opening the Emergency valve (8) bypasses all conditions, drains the FDV valve’s control chamber and opens the valve immediately.

### Rest position.

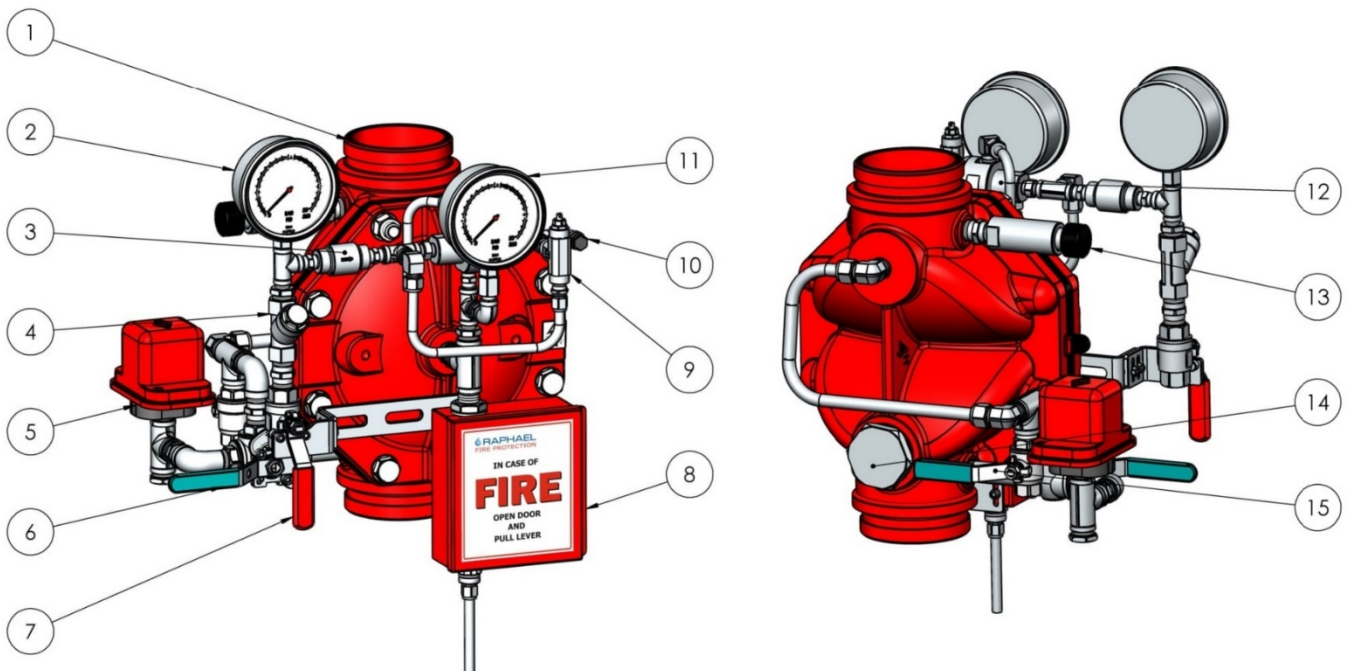
Resetting this system requires the replacement of all Wet Pilot line’s blown-open automatic sprinklers. This replacement enables pressurizing the Wet pilot line and the HAV-3 control chamber (12).

As the HAV-3 moves to its CLOSE state, it pressurizes the FDV’s control chamber. Consequently, the FDV valve closes, and the open nozzles spray stops. By that, the system moved into the SET position.

## FDV-3W-DH1 – 3 way hydraulic Actuated with Remote Reset Deluge Valve

### Parts list

- |                                  |                              |
|----------------------------------|------------------------------|
| 1. – Deluge valve                | 14. – Downstream drain valve |
| 2. – Upstream pressure gauge     | 15. – Upstream drain valve   |
| 3. – Check Valve                 |                              |
| 4. – “Y” Strainer                |                              |
| 5. – Pressure Switch (optional)  |                              |
| 6. – Alarm Test Valve (3 way)    |                              |
| 7. – Trim supply valve           |                              |
| 8. – MEU (manual Emergence)      |                              |
| 9. – Needle valve                |                              |
| 10. – Wet pilot port             |                              |
| 11. – Upstream pressure gauge    |                              |
| 12. – HAV-3 hydraulic actuator   |                              |
| 13. – MADV automatic drain valve |                              |



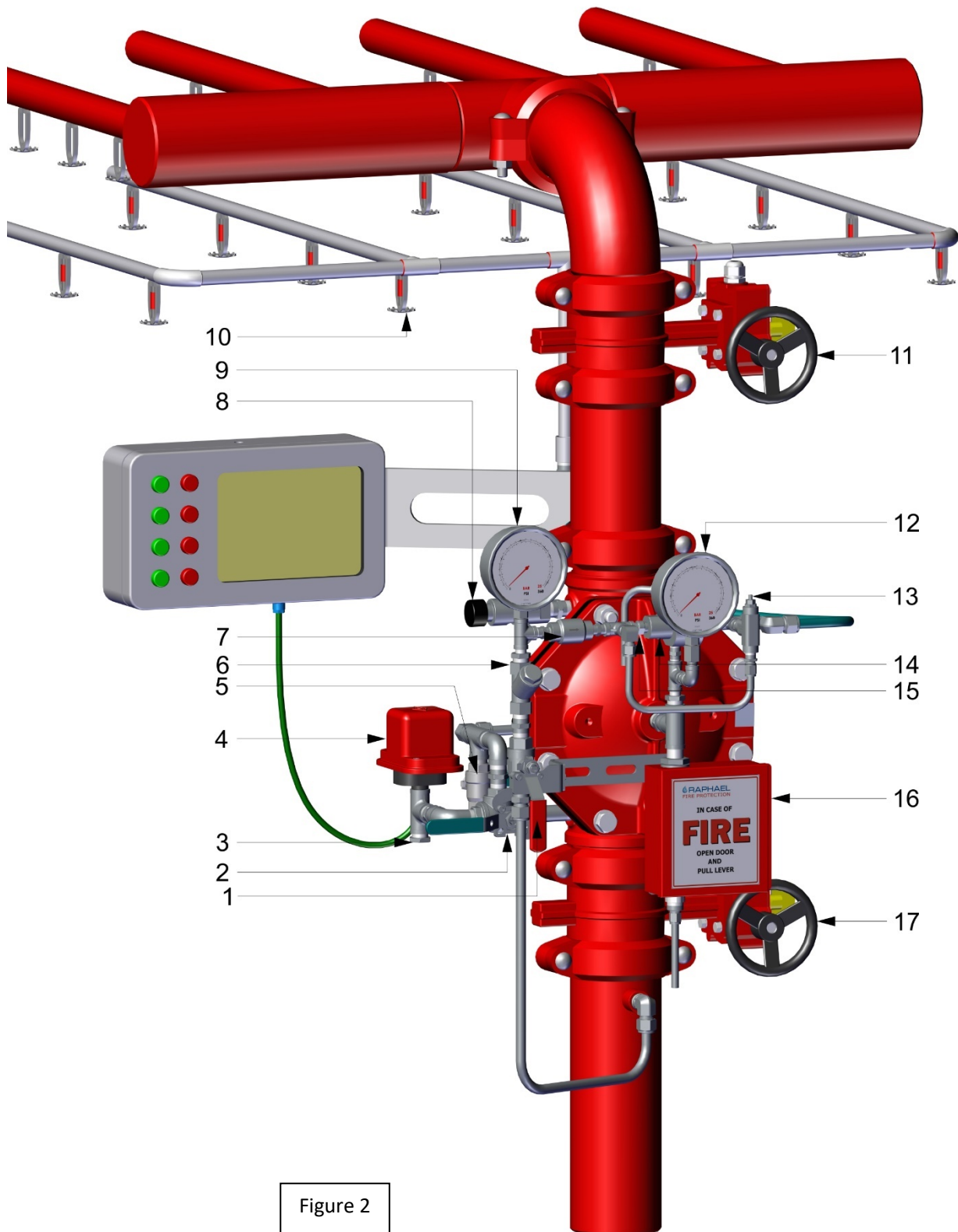
## **Installation**

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1. This system is supplied pre-assembled and factory pre-adjusted. Any change carried out at the system's trim components adjustments or order, pipe and tubes length or ports for axillary connection sizes, will affect the system operation and therefore, prohibited.
2. The system cannot be installed at a location where it might be subjected to freezing temperatures.
3. To enable assembly/disassembly and maintenance work, sufficient room around the system location should be kept.
4. It should be taken by account that water will be drained during regular maintenance on a routine base, during periodical tests procedures and when operating in fire situation. Therefore, a drainage plan should be considered.
5. Systems with identical operation but for horizontal installation are marked with a prefix "H", e.g. HFDV-3W-DH1.
6. At horizontal or vertical installation, the pipes connected to the FDV valve, need to be supported firmly to prevent the pipeline's weight from being loaded on the system's valve.
7. Any use of pipe/thread reduction-fittings installed at open ports designated for axillary components, (like Wet pilot pipeline connection, FDV valve's drains and Emergency drainpipe), is prohibited.
8. All connections to water supply, alarms etc. should be done in accordance with figure 2:
  - (1) – Trim pressure supply connection
  - (9) – Wet pilot pipe connection.
9. The FDV valve should be installed with the flow arrow marked on the valve's body, in the proper direction.

## **Installation parts list**

1. Trim supply valve (1/2" NPT female)
2. 3-Way alarms test valve
3. Water motor alarm \* connection port (1/2" NPT. Plugged)
4. Pressure switch \*
5. Downstream drain valve (1/2" NPT female)
6. "Y" Strainer
7. Check valve
8. MADV manual automatic drain valve
9. Upstream pressure gauge
10. Wet pilot line
11. Downstream separation butterfly valve
12. Emergency valve
13. Needle valve
14. 3-way Hydraulic actuator HAV-3
15. Orifice
16. MEU manual emergency unit
17. Upstream separation butterfly valve



## Commissioning the system - phase 1.

### Filling and pressurizing the system

*The procedure described should be carried out after system installation completion and a comprehensive inspection.*

(Reference Drawing - figure 2)

1. Make sure the upstream and downstream butterfly valves (**11 & 17**) are fully close. In addition, make sure that upstream drain valve (if equipped) is closed.
2. Make sure the trim pressure supply ball valve (**1**) is Closed.
3. Make sure that Emergency valve (**16**) is fully closed.
4. Open the inspector's valve located at the very end of the wet pilot's pipeline.
5. Fully open the needle valve (**13**). Then, open the trim pressure supply valve (**1**) and fill the trim, wet pilot and let water flow out of the inspector's valve until a clear flow, free of air bubbles is observed.
6. Close the inspector's valve and pressurize the trim, the FDV's control chamber the wet pilot's line and the HAV-3's control chamber. Check the Wet pilot line's gauge (not illustrated) for a proper pressure.
7. Gradually open the upstream butterfly valve (**17**) and make sure the downstream drain valve is not dripping. A dripping might indicate a FDV valve sealing issue. (see Troubleshooting chapter in FDV's basic valves datasheet & IOM bulletin)

The system is ready for the "**fire situation simulation**".



## Commissioning the system - phase 2.

### Fire Situation Simulation

*The procedure described, should be carried out after the system was pressurized and a comprehensive leakage inspection was commissioned. Energizing the solenoid can simulate a fire situation and cause the system to response by opening the FDV deluge valve.*

#### **NOTICE:**

***Prior to any stoppage of the fire protection system, a fire patrol should be placed in the area covered by the interrupted system.***

***Prior to generating any test procedures, turning on false alarms or turning off the alarm system, the local safety personnel and the close central fire station must be reported.***

(Reference drawing - figure 2)

1. Untighten the counter nut and turn the needle valve stem fully open.
2. Make sure that the downstream butterfly valve (**11**) is close and that the FDV's downstream drain valve (**5**) is open.
3. Open the inspector valve at the wet pilot.
4. The deluge valve supposes to open: Observe water flow through the open FDV's downstream drain valve.
  - a. If the deluge valve trips and opens, no additional adjustment is needed. Perform the chapter **Commissioning the system - phase 3.**- Resetting & placing in service.
  - b. If the deluge valve does not trip and opens, perform the "Needle valve adjustment procedure".

#### **Needle valve adjustment procedure**

*The Needle valve needs to be re-set during the first actuation as its state is influenced by the wet pilot pipeline height, length and the working pressure of the deluge system. The purpose of this adjustment is to ensure that the needle valve's rate of flow will be smaller than the rate of flow of the most remote sprinkler installed on the pilot pipeline ("overcompensation of the pilot line")*

- If the Deluge system remains close (**b.**), the needle valve should be closed gradually until the deluge trips to open.
- If ok, secure the needle valve stem by tightening the counter nut firmly.

**Note:**

- If the needle valve is turned too open, the deluge valve might not open.
  - If the needle valve is turned too close, it will take a long time to fill and pressurize the wet pilot line at the time of the next fire simulation or real fire situation.
5. After needle valve adjustment, perform the chapter Commissioning the system - phase 3.- Resetting & placing in service.

## **Commissioning the system - phase 3.**

### **Resetting & placing in service**

*The procedure described should be carried out after any periodic operational test simulated or real fire situation.*

1. after Simulated fire situation:

- Close the upstream separation butterfly valve (17).
- Close the Wet pilot line inspector's valve.
- Follow steps 2-7.

After a Real fire situation) :

- Close the upstream separation butterfly valve.
- Replace the blown-open automatic sprinklers on the Wet pilot line.
- Follow steps 2-6.

2. Close the trim pressure supply valve (1).
3. Clean the trim strainer's screen (6). Re-assemble the strainer's screen.
4. Open the trim pressure supply valve.
5. Open the butterfly valve (17). The FDV valve should remain closed.
6. Let the pipeline to drain through downstream drain valve or push the MADV push button. At drainage end, close this valve.
7. Open the downstream butterfly valve (10).

**System is in SET state and placed in service.**

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## Maintenance

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*Prior to any stoppage of the fire protection system, a fire patrol should be placed in the area covered by the interrupted system.*

*Prior to generating any test procedures, turning on false alarms or turning off the alarm system, the local safety personal and the close central fire station must be notified.*

*The Maintenance and inspection procedures are based on the relevant chapters at the NFPA 25.*

## Daily Inspection

Make sure that the deluge valve's heating system (If equipped), functions correctly and that the Fire protection valve surrounding temperature is 4°C min.

## Monthly Inspection

1. Observe the FDV deluge valve and its trim for external damage: observe the trim piping and hose connections for leakage or damage.
2. Verify that the upstream and downstream separation butterfly valves (11 & 17) and the Trim pressure supply valve (1) are in fully open position.
3. Open the downstream drain valve or push the MADV (8) push-button. Make sure there is no leakage or dripping. When done, close this ball valve or stop pushing the MADV push-button.
4. Move the 3-way ball valve handle for set to test. The alarm pressure switch should send a signal to the main control hub, and the acoustic alarm (WMA, if equipped) should sound.

## Annual test procedure

1. Conduct the monthly test & inspection procedure.
2. Perform the procedure described in chapter - **Commissioning the system - phase 2.** - Fire Situation Simulation. Check the system's proper operation.
3. Follow the procedure described in chapter - **Commissioning the system - phase 3.** - Resetting & placing in service, chapter **Resetting & placing in service.**

## Every 5 years inspection procedure

*This major inspection procedure includes the removal of the trim, the dismantling of the FDV's valve cover and a performance of a comprehensive internal parts examination. Then, the relevant trim accessories should be maintained, referring to their maintenance instruction. After the completion, the Annual maintenance procedure is to be conducted.*

1. Close both butterfly valves (**11 & 17**) and the trim pressure supply valve (**1**).
2. Open the drain valves (**5**) and the upstream drain valve if equipped. Drain the FDV's control chamber using the Emergency valve (**16**).
3. Open the Wet pilot line inspector's valve and depressurize.
4. Turn off or disconnect all relevant electrical circuits (if exist).
5. Disconnect the Wet pilot line's connection. Release all relevant tubes fitting nuts and the central union pipe connection.
6. Remove the disassembled trim.

7. Remove all the FDV's cover bolts. The cover will hang on its studs. (vertical installation, from 4" and up). Release both nuts and remove the cover carefully.
8. Observe the internals of the valve and cover for excessive scale residuals, foreign particles, damaged coating (rust, cracks, or peeling). Worn or damaged parts should be replaced. Consult Raphael's local representative or the service department for any maintenance or part replacement issue.
9. Replace the Diaphragm with the one supplied with the system's maintenance kit. The identification tongue should point to the valve's stamped flow direction arrow side.
10. Reinstall the valve's cover: use the Anti-seize paste tube supplied at the maintenance kit and lubricate bolts and nuts threads. Tight bolts and nuts in accordance with "Bolt's torque moments table".
11. The trim accessories HAV-3 and MADV should be replaced in accordance with the NFPA-25, in "Standard for the inspection testing and maintenance of water-based fire protection systems".
12. Reinstall the trim carefully: avoid causing twists or dents on bent tubes and do not overtight the compression fitting's nuts.
13. When the system is fully reassembled, perform the "**Commissioning the system - phase 1** - Filling and pressurizing the system" procedure.
14. Perform the "**Annual test procedure**".

## Bolt's Torque Moments Table

Valve size	1.5"	2"	2.5"	3"	4"	6"	8"	10"
Torque lb/ft	22	29	36	54	65	72	87	118

## Equivalent pipe length for FDV deluge valves

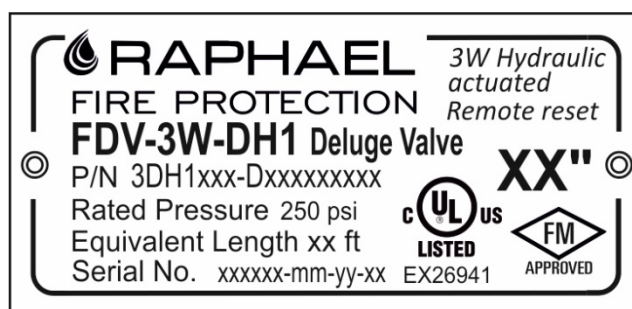
Valve size	Equivalent length value ft (m)
1.5"	11 (3.6)
2"	24 (7.3)
2.5"	25 (7.6)
3"	28 (8.5)
4"	31 (9.4)
6"	46 (14)
8"	72 (21.9)
10"	117 (35.6)

## Marking

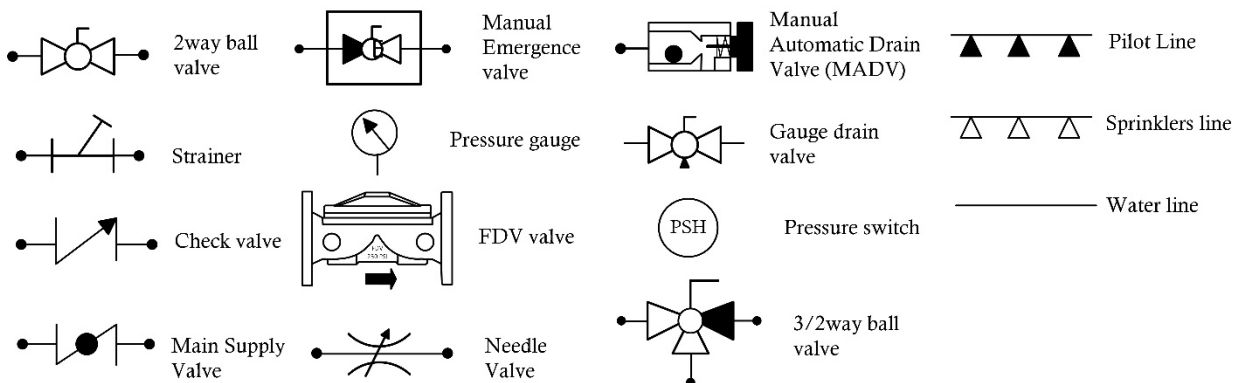
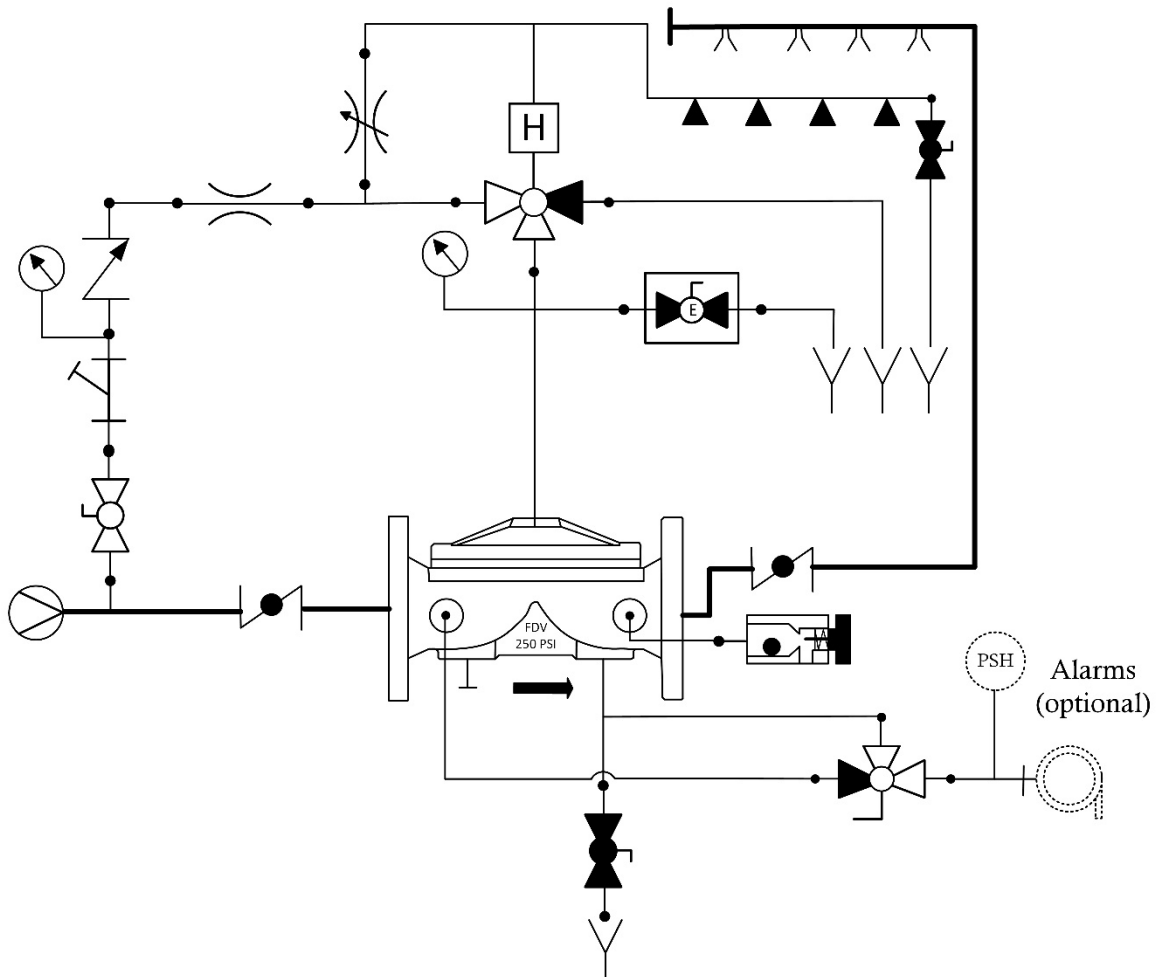
The FDV valves are marked by a laser engraved, black anodized, 63 x 30 mm 0.8mm (0.031") thick aluminium metal plate, riveted to the valve's cover.

The marking plate contains the data about:

- *Company name and trademark.*
- *Application's type - 3-way Hydraulic actuated, Remote Reset.*
- *The Application's part number (P/N) - actuation type–valve properties*
- *Rated pressure - 250 psi.*
- *Equivalent Length: reference table - page 13.*
- *Serial Number – work order-MM-YY-xx (number in batch 01-99)*
- *The UL listing mark & QR code. – xxxxxx*
- *The FM approved mark*
- *The Application's diameter in inch - xx"*



Hydraulic actuated, 3W Hydraulic Operation, Remote reset FDV deluge valve, Type: **FDV-3W-DH1**





**RAPHAEL**, founded in 1949, is the first Israeli manufacturer of water control valves. RAPHAEL 's research department constantly strives to introduce new and innovative products and solutions for water control systems including water works, fire-protection and irrigation systems.



Waterworks



Fire Protection



Irrigation



Smart Solutions

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